Visitors' Guide

to the

INSTITUTE OF FOREST GENETICS

Miscellaneous Paper No. 5 - September 1 1951
CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
U. S. Department of Agriculture--Forest Service

The Institute of Forest Genetics is a field branch of the California Forest and Range Experiment Station, which the U. S. Forest Service maintains at Berkeley in cooperation with the University of California.

--Stephen N. Wyckoff,
Director.

AGRICULTURE--Berkeley

GUIDE TO THE

INSTITUTE OF FOREST GENETICS

This guide is intended to help visitors find their way to, and understand, the various collections and field experiments at the Institute of Forest Genetics. A general account of the objectives, history, and accomplishments of the Institute is given in Miscellaneous Publication No. 659 of the United States Department of Agriculture, entitled "Tree Breeding at the Institute of Forest Genetics." This is available on request.

Briefly, the objective of the Institute's program is to develop better pine trees through the science of genetics and the techniques of plant breeding. Improvements sought are faster growth, improved form and wood properties, and resistance to diseases, insects, and climatic hazards. The visitor can see here evidence of improvement in each of these qualities.

The principal means of improvement are selection and hybridization. Selection is a search for trees that show superior qualities in the forest so seed or cuttings from these trees may be used in planting new forests. The trees, and cuttings from them, are also used in hybridization work. Hybridization creates new kinds of trees by controlled pollination, which can combine the qualities of two varieties of trees in the hybrid. This is done by dusting pollen of one variety on the seed-bearing conelets of another variety under controlled conditions. (Canvas bags tied around the tips of branches are used to protect the conelets, and many trees on the Institute grounds bear this evidence of controlled pollination in the spring.) In the tree-breeding research of the Institute, selection and hybridization are often used as complementary methods, carefully selected parent species being crossed to produce pedigreed offspring.

The outdoor facilities at the Institute are the Eddy Arboretum, which contains about 70 species of pines and numerous other trees; the nursery, in which hybrids and other pedigreed pine seedlings are propagated and tested for early performance; and the hybrid plantations, in which later development of improved trees is studied and in which hybrid and pedigreed seed for large-scale reforestation is produced. A fourth area of special interest is a large plantation of elevational races of ponderosa pine. These areas are shown on the accompanying map.

The Eddy Arboretum

This collection of pines is named in honor of Mr. James G. Eddy, whose gift of the Eddy Tree Breeding Station to the people of the United States in 1935 gave rise to the present Institute. The Eddy Arboretum has served three principal purposes. First, the species of pines assembled here from many parts of the world furnish the materials for the Institute's program of pine breeding. Almost every one of the world's 90 species of pines has been planted. Of these only about 70 survive, and some of these do not thrive here. Many species, not native to this region, have grown well for more than 25 years. Thus the Arboretum also serves as a pine introduction test garden. Thirdly, this living collection of pines is constantly studied by botanists and horticulturists and is used for demonstration purposes by many teachers and their classes.

Foresters and geneticists, particularly, will be interested in the general plan of the Eddy Arboretum, which is as follows: Ponderosa pine (Pinus ponderosa Laws.), from about 50 distinct geographic areas throughout western North America, grow along the eastern edge of the Arboretum in the hard-pine group. This is a reflection of the great commercial importance of this species and of the fact that it is composed of many widely differing geographic races. (This collection differs in location and purpose from the extensive ponderosa pine plantations shown on the map to the southwest of the hard-pine group. These plantations are largely composed of open-pollinated progenies of single trees located on the west slope of the central Sierra Nevada.) The remainder of the Arboretum consists of other species of pines, arranged according to their assumed relationships. The basic unit of planting is a square of 16 trees, although this plan was not invariably followed. Thinnings, to promote growth and cone production, have further broken up the groups of trees. Original spacing between trees was 15 by 15 feet. Trees are marked by one of two methods. Older tree tags are set on stakes and carry both the Latin and English names of the tree, the origin of the seed from which the tree was grown, and sometimes the nursery in which the seed was sown. The year date denotes the year in which the seed was sown, and thus present age of the tree may be calculated. Row and line (or tree) numbers on the tags are for use in maintaining research records. Newer tree tags are wired to branches or nailed to the stems. They are somewhat abbreviated, omitting English names. The bottom line on these tags gives row and line number, followed by the last two digits of the year in which seed was sown.

Informational signs will be found at points of special interest in the Arboretum. A list of trees growing in the Arboretum (Research Note No. 53) is available on request.

The Nursery

Nursery tests are used for four purposes: (1) to study the early growth of hybrids and other pedigreed seedlings; (2) to grow pedigreed planting stock for plantation tests at the Institute and elsewhere; (3) to accommodate insect and disease studies; and (4) to demonstrate techniques and results. No planting stock for general reforestation purposes is grown here.

For those interested in the techniques employed in this nursery, a general account is available (Research Note No. 56). The nursery experiments are usually set up either as (1) tests in which a group (sample) of hybrid or other pedigreed seedlings is pitted against a group of seedlings grown from wind-pollinated seeds from one of the parents — usually the seed-parent tree; or (2) tests in which the hybrids or other pedigreed seedlings are pitted against the natural progenies from both the seed- and pollen-parent trees or species.

Generally, each sample included in a test is allocated to several rows (plots) running across the seedbed. The rows assigned to hybrid and non-hybrid groups are determined at random. The nursery rows (plots) are numbered from west to east, and each experiment is laid out accordingly. An aluminum label, bearing the experiment number, kind of test, etc., is attached to the north sideboard of the seedbed at the beginning of each experiment. For experiments started in 1950 and thereafter, the kind of trees in each row is designated by a spot of color printed on the sideboard, as follows: Yellow, hybrid; white, natural progeny of seed parent; black, natural progeny of pollen parent.

Signs located about the nursery give information about tests of special interest.

The Hybrid Plantations

Small test plantations of hybrids and other pedigreed trees are located to the east of the buildings. These plantings are set out at the spacing normally used for reforestation in the California region (8 by 8 feet), and, with moderate thinning, should serve to test the performance of these new types up to harvest age. These plantations serve also as material for further breeding and selection experiments, and have for some years furnished large quantities of hybrid seed for cooperative tests by other institutions. The more interesting tests are posted with explanatory signs.

Elevational Races of Ponderosa Pine

The easternmost plantation is a test, established in 1938, of elevational races of Pinus ponderosa from the west slope of the Sierra Nevada. This pine is of leading commercial value in the pine region of California. The object of the study is to determine from which elevation seed of this species should be collected for reforestation purposes. Details of this experiment and of the results so far obtained are furnished on a signboard to the west of the plantation.

WE ASK VISITORS:

1. Not to smoke except on paved roads.

2. Not to picnic. Our resources must all be devoted to research; and we cannot afford to maintain picnic facilities.

3. To close all gates which are found closed.

4. To sign our register.

5. To help themselves to any cones lying on the ground.

All of our plants are propagated for experimental purposes. As a government agency, we cannot sell or give away plants or seed.

To Placerville 4-1/2 mi.

WHITE PINES

EDDY ARBORETUM

HARD PINES

PONDEROSA PINE

PLANTATIONS

Entrance

NURSERY

Pumphouse

Dwellings

Parking

Office and Laboratory

Well house

Cone and seed handling

Greenhouse

Warehouse and Garage

HYBRID

PLANTATIONS

ELEVATIONAL RACES

PONDEROSA PINE

JEFFREY PINE

N

0 200 400 600

FEET

INSTITUTE OF FOREST GENETICS

LOCATION OF FACILITIES AND EXHIBITS

CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
FOREST SERVICE - U. S. DEPARTMENT OF AGRICULTURE

STATION LIBRARY COPY

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PLACERVILLE, CALIFORNIA

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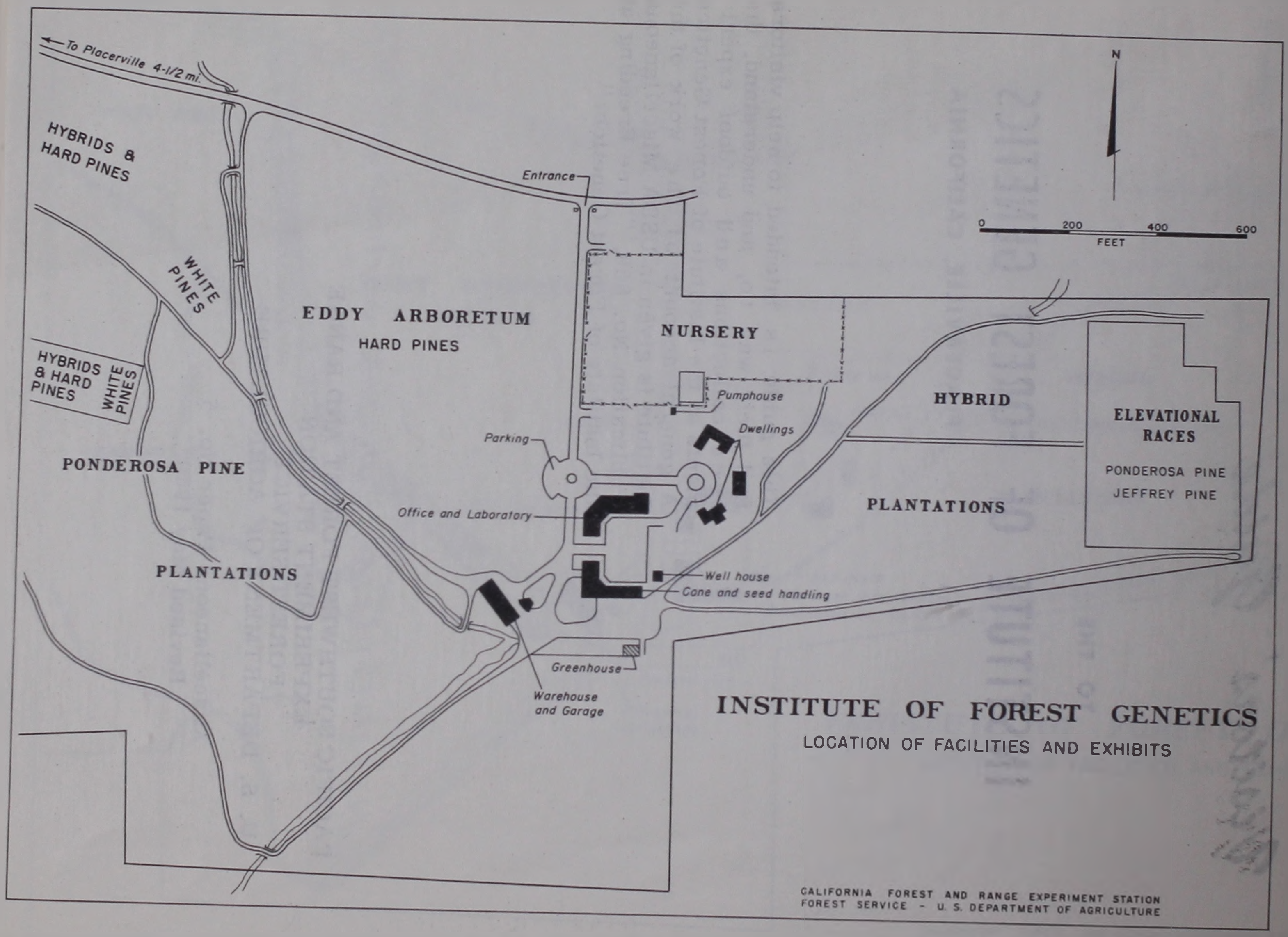
CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
PACIFIC SOUTHWEST FOREST AND RANGE
EXPERIMENT STATION
FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE

Miscellaneous Paper No. 5
Revised May 1960


To Placerville 4-1/2 mi.
HYBRIDS & HARD PINES
Entrance
N
0
200
400
600
FEET
WHITE PINES
EDDY ARBORETUM
HARD PINES
NURSERY
HYBRIDS & HARD PINES
WHITE PINES
Pumphouse
HYBRID
Dwellings
Parking
ELEVATIONAL RACES
PONDEROSA PINE
JEFFREY PINE
PONDEROSA PINE
PLANTATIONS
Office and Laboratory
PLANTATIONS
Well house
Cone and seed handling
Greenhouse
Warehouse and Garage
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LOCATION OF FACILITIES AND EXHIBITS
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THE RESEARCH PROGRAM

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Trees are crossed by dusting pollen of one onto the seed-bearing conelets of another under controlled conditions. Canvas or sausage-casing bags tied around the tips of branches are used to protect the conelets, and many trees on the Institute grounds bear this evidence of controlled pollination in the spring.

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FACILITIES

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Other areas of special interest are: a large field test of natural progenies of 81 ponderosa pines, and a large field test of elevational races of that species.

Laboratories and greenhouses are equipped for basic studies of the nature and growth of forest trees and of their reproductive processes. Because experimental work in these facilities requires carefully controlled conditions, laboratories and greenhouses are shown only by special appointment.

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